IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: THIRY, Pol Jean-Marie Robert

SERIAL NO.: 10/537,652 ART UNIT: 3732

FILED: February 27, 2006 EXAMINER: Kilkenny, P.J.

TITLE: ORTHODONTIC WIRE AND METHOD FOR MAKING SAME

AMENDMENT "A"

Director of the U.S. Patent
and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action of July 5, 2005, a response being due by October 5, 2006, please enter the present amendments and consider the following remarks:

REMARKS

Upon entry of the present amendments, original Claims 1 - 8 have been canceled and new Claims 9 - 16 substituted therefor. Reconsideration of the rejections, in light of the forgoing amendments and present remarks, is respectfully requested. The present amendments have been entered for the purpose of placing the claim language into a more proper U.S. format and for the purpose of more clearly defining the present invention.

In the Office Action, it was indicated that Claims 1 - 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Farzin-Nia patent in view of the Yamazaki patent. Claims 2 - 8 were also objected to under 35 § U.S.C. 112, second paragraph, as being indefinite.

As an overview to the present reply, Applicant has revised the original claim language in the form of new Claims 9 - 16. New independent Claim 9 is the "apparatus" claim, which defines the invention as a wire of titanium-molybdenum alloy, further recites that the outer surface layer of titanium nitride is "free of titanium oxide". Proper Markush language has been used so as to indicate that the titanium nitride is selected from the group consisting of TiN and Ti_2N. New independent Claim 10 is the method claim which defines the steps for forming the metallic wire. In particular, independent Claim 10 specifies that the wire is "suitable for use with attachments for bonding on teeth so as to correct a position of the teeth". This specifies that the product of the method of the present invention is particularly used for orthodontic wire. New independent Claim 10 further recites that the outer surface layer "of titanium nitride" is formed on the wire "by superficially implanting N^+ and N^{++} ions in a vacuum enclosure at an temperature of less than 450°C ". Proper Markush language has been used so as to indicate that the titanium nitride is either TiN and Ti_2N. The claims herein have been revised so as to conform with U.S. format requirements, including proper antecedent bases and proper structural interrelationships throughout. Any indefinite terminology found in the original claim language has been corrected herein.

Relative to the prior art Farzin-Nia patent, it important to note that the purpose of the Farzin-Nia device is to create a more visually appealing (see Column 1, lines 13-14) and aesthetically pleasing (see Column 1, lines 58-59) orthodontic appliance. As indicated by the examiner, the Farzin-Nia does not disclose the use of the titanium-molybdenum alloy and does not disclose that is it formed "under vacuum conditions". Additionally, the Farzin-Nia fails to disclose that the titanium-molybdenum alloy has a nitride layer that is "free of titanium oxide". Applicant respectfully contends that there is no teaching in the Farzin-Nia patent that would suggest that benefits could be

achieved by having such a surface layer nor does it teach the ability or purpose for including such a outer surface layer.

Relative to independent Claim 9, Applicant respectfully contends that the Farzin-Nia patent fails to show the "wire of titanium-molybdenum alloy", the outer surface layer of "a titanium nitride", the outer surface layer that is "free of titanium oxide", and that the titanium nitride is either TiN or Ti_2N.

Relative to the independent method Claim 10, Applicant respectfully contends that those methods identified in Column 2, lines 42-47 of the Farzin-Nia Patent do not disclose proper parameters for creating the orthodontic wire. The Farzin-Nia patent does not disclose temperature conditions. These temperature conditions are very important in establishing proper mechanical properties of the metal (e.g. elasticity). In particular, the Farzin-Nia patent fails to show the step of "forming the wire of the titanium-molybdenum alloy" and the "superficial implantation of N+ and N++ ions in a vacuum enclosure". The Farzin-Nia patent fails to show an outer surface layer "of titanium nitride". As such, Applicant respectfully contends that the Farzin-Nia patent fails to show the steps of independent Claim 10. Since the purpose of the Farzin-Nia patent is quite different than the purpose of the present invention, Applicant respectfully contends that such steps would not be obvious to one of ordinary skill in the art.

The Yamazaki patent identifies a method of forming insulating films, capacitors, and semiconductor devices. Applicant respectfully contends that this patent is from a field of art far removed from that of the field of forming orthodontic wire. Applicant respectfully contends that one of ordinary skill in the art seeking to improve the qualities of the orthodontic wire would not turn to the field of semiconductor devices in order to develop the orthodontic wire of the present

invention nor to carry out the methods of the present invention. On this basis, Applicant respectfully contends that the combination of these non-analogous references would not be "obvious" nor would one having ordinary skill in the art combine such references.

The Yamazaki patent describes methods for forming insulating film. Applicant respectfully contends that there is no "insulation" purpose in the present invention. Insulating can be obtained by the use of oxides or nitrides dielectric layers. In the Yamazaki patent, it is important to include oxygen in order to achieve this insulating quality. When nitride sputtering is considered, the Yamazaki patent fails to mention the friction coefficient of a titanium alloy. Only the dielectric properties of nitride films are considered (see Column 2, lines 36 - 39). As such, the Yamazaki patent would fail to suggest the step of forming the outer surface layer of titanium nitride "in a vacuum enclosure" and that the titanium nitride is "free of titanium oxide". On this basis, the friction coefficient of the titanium alloy would be non-obvious to one having ordinary skill in the art of the Farzin-Nia patent, individually, or in combination with the Yamazaki patent. Applicant respectfully contends that there is nothing in the Yamazaki patent nor the Farzin-Nia patent to suggest the use of a "vacuum".

Relative to the prior art combination, Applicant respectfully contends that the prior art combination would not lead to the orthodontic wire of the present invention. One having ordinary skill in the art of these prior art patents would not make a connection between the disclosures of these patents and the problems associated with orthodontic wire. A person of ordinary skill in the art would never know that a "vacuum" was needed to prevent titanium oxide formation. Although the second embodiment of the Yamazaki patent suggests "evacuation" on the inside of the apparatus (see Column 4, line 7) and oxide film deposition, the Yamazaki patent fails to specify the "evacuation" for the deposition of nitride films. Additionally, oxide film deposition would

absolutely require oxygen and would not produce a product that was "free of titanium oxide".

Relative to independent Claim 9, it is important to note that wires of titanium-molybdenum alloy are in the prior art and are the closest prior art. This was disclosed in the original specification. However, as was disclosed, it is important to be able to improve these wires of titanium-molybdenum alloy for use as orthodontic wire. In particular, it is important to lower the friction coefficient. The invention in the present application is achieved by the implantation of ions in the absence of oxygen so as to avoid the creation of titanium oxides. It has been found that these titanium oxides deteriorate the friction coefficient (see paragraph [0037]). As such, the present invention defines a titanium-molybdenum alloy with a nitride layer that is "free of titanium oxide". As such, a lower friction coefficient is achieved without compromising the mechanical integrity of the wire. The prior art combination does not disclose this feature nor does it disclose the advantages achieved by such a material composition. The Yamazaki patent is clearly from a different field of art. Even if one of ordinary skill in the art could combine the Farzin-Nia and Yamazaki patents, they would still have no knowledge of how to reduce the friction coefficient of the titanium-molybdenum alloy wire while maintaining the mechanical properties of such wire.

Similarly, relative to the method Claims 10 - 16, the prior art combination, even such a combination would be recognized by one ordinary skill in the art, would not disclose the procedure for obtaining wires of titanium-molybdenum alloy with a nitride layer free of the titanium oxides. There would be no suggestion of working under a vacuum nor an oxygen-free environment. As such, once again, the benefits achieved by the method of the present invention, as defined by Claims 10 - 16, would not be obvious to one of ordinary skill in the art.

By the present Amendment, independent Claim 9 corresponds to original independent Claim 1. Dependent Claim 10 - 16 correspond, respectively, to the limitations found in original Claims 2 -

8.

Based upon the foregoing analysis, Applicant contends that independent Claims 9 and 10 are now in proper condition for allowance. Additionally, those claims which are dependent upon these independent claims should also be in condition for allowance. Reconsideration of the rejections and allowance of the claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

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Date

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